

A Small, Remotely Operated, Coronagraph located at Small Observatory to obtain Frequent Low-cost Remote Observations of the Lunar Exosphere

Author Names and Affiliations

First Name: Thomas

Last Name: Morgan

Department: Code 690.1

Institution: Goddard Space Flight Center

Address: 8200 Greenbelt Rd

Country: United States

Email: thomas.h.morgan@nasa.gov

Co-authors: Rosemary Killen, NASA/GSFC, USA

Roy Tucker, UA, USA

Andrew Potter, NSO emeritus, USA

The sodium in the lunar exosphere is a marker for the study of the lunar exosphere because the sodium possesses two strong resonance transitions from the ground state whose wavelengths fall in the visible spectrum near 590 nm. Emissions at these wavelengths are thus, observable from Earth. Observations have shown that the exosphere responds in a complex way to the external processes (impact vaporization, sputtering, and photon stimulated desorption) that weather the lunar regolith to produce the sodium (Sarantos et al., Icarus, 205, 2010). Unraveling the sodium production allows us to study the processes that weather the regolith. Obtaining the extensive time sequence of observations required to unravel the sources of sodium using conventional observatories is impractical, and too expensive. Effectively imaging the lunar sodium exosphere close to the Moon requires an off-axis rejection of scattered light that can only be obtained with a coronagraph sited at an observatory dedicated to remote robotic observing (the Winer Observatory in Sonoita Arizona) that can obtain the quality and quantity of lunar sodium observations needed to answer these questions, and at modest cost. The design uses Commercial Off the Shelf Technology (COTS). We are working to begin routine the observations before the launch of the Lunar Atmosphere and Dust Environment Explorer (LADEE) mission.